SOV/2o-121-4-31/54

5(4)
AUTHORS: Smirnov, M. V.,   Ivanovskiy, L. Ye.,   Loginov, N. A.

TITLE: The Equilibrium Potentials of Titanium in Chloride Melts
             (Ravnovesnyye potentsialy titana v khloridnykh rasplavakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 121, Nr 4, pp 685-688
             (USSR)

ABSTRACT: The authors measured the equilibrium potentials in pure argon
             in a hermetically closed wide test tube of quartz. On the
             bottom of this tube there was an eutectic mixture of lithium
             chloride and potassium chloride. An electrode of titanium
             iodide was fastened to a molybdenum feeder and it was immersed
             in a salt melt of the same composition. The potential of the
             titanium electrode was measured with respect to a lead elec-
             trode. The results of the measurements, (with respect to a
             chlorine electrode of comparison) are given in a diagram
             which demonstrates the dependence of the electromotive force
             on the temperature for various given concentrations of the
             titanium in the electrolyte. The experimental points agree
             well with straight lines. Another diagram shows the isothermal
             lines deduced from the above-mentioned results for 700, 800,

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The Equilibrium Potentials of Titanium in Chloride Melts

900, and 1000°K. The equilibrium potential of the metallic titanium electrode in chloride melts which contain less than 6 weight % of titanium depends on its molar concentration in the electrolyte according to the following thermodynamical equation:

$$E = E^{o}_{Ti/Ti^{2+}} + (2,3\ RT/2F)\ lg\ \left[Ti^{2+}\right].$$

This shows that such melts contain ions of divalent titanium and behave as ideal solutions. The quantity $E^{o}_{Ti/Ti^{2+}}$ may be found from the above-mentioned experimental data, $E^{o}_{Ti/Ti^{2+}} = (-2,371 + 6,09.10^{-4}T)V$ is obtained with respect to the chlorine electrode. For the calculation of the isobaric potential for the composition of the liquid titanium dichloride from the elements the equation $\Delta Z = (-109\ 360 + 27,03\ T)$ cal/mol $TiCl_2$ may be used. There are 4 figures and 12 references, 3 of which are Soviet.

Card 2/3

SOV/2o-121-4-31/54

The Equilibrium Potentials of Titanium in Chloride Melts

ASSOCIATION: Laboratoriya elektrokhimii Ural'skogo filiala Akademii nauk SSSR
(Laboratory of Electrochemistry of the Ural Branch, AS USSR)

PRESENTED: April 11, 1958, by A. N. Frumkin, Academician

SUBMITTED: March 25, 1958

Card 3/3

SMIRNOV, M.V.

Smirnov, M.V., and L.Ye. Ivanovskiy (Institute of Chemistry, Urals Branch, Academy of Sciences USSR). Electrolysis of a Chloride Bath With Titanium Monoxide Anodes, p. 100. Titan i yego splavy. vyp. II: Metallurgiya titana (Titanium and Its Alloys. No. 2: Metallurgy of Titanium) Moscow, Izd-vo AN SSSR, 1959. 179 p.

This collection of papers deals with sources of titanium; production of titanium dioxide, metallic titanium, and titanium sheet; slag composition; determination of titanium content in slags; and other related matters. The sources of titanium discussed are the complex sillimanite ores of the Kyakhtinskoye Deposit (Buryatskaya ASSR) and certain aluminum ores of Eastern Siberia. One paper explains the advantages of using ilmenite titanium slags for the production of titanium dioxide by the sulfuric acid method. Production of metallic titanium by thermal reduction processes (hydrogen, magnesium, and carbon reduction) is the subject of several papers, while other papers are concerned with the electrolytic production of titanium. Other subjects dealt with are interaction of titanium with water vapor and with hydrogen and the determination of titanium in slags.

SMIRNOV M.V.

BAKHCHISARAITSEVA IAN, N.

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PHASE I BOOK EXPLOITATION   SOV/2216

Soveshchaniye po elektrokhimii. 4th, Moscow, 1956.

Trudy...; (sbornik) (Transactions of the Fourth Conference on Electrochemistry; Collection of Articles) Moscow, Izd-vo AN SSSR, 1959. 868 p. Errata slip inserted. 2,500 copies printed. Sponsoring Agency: Akademiya nauk SSSR. Otdeleniye khimicheskikh nauk.

Editorial Board: A.N. Frumkin (Resp. Ed.) Academician, O.A. Yesin, Professor; S.I. Zhdanov (Resp. Secretary), B.N. Kabanov, Professor, Professor, S.I. Zhdanov (Resp. Secretary); B.N. Kabanov, Professor; Ya. M. Kolotyrkin, Doctor of Chemical Sciences; V.V. Losev, P.D. Lukovtsev, Professor; Z.A. Solov'yeva; V.V. Stender, Professor; and O.M. Florianovich; Ed. of Publishing House: N.G. Yegorov; Tech. Ed.: T.A. Prusakova.

PURPOSE: This book is intended for chemical and electrical engineers, physicists, metallurgists and researchers interested in various aspects of electrochemistry.

COVERAGE: The book contains 127 of the 138 reports presented at the Fourth Conference on Electrochemistry sponsored by the Department of Chemical Sciences and the Institute of Physical Chemistry, Academy of Sciences, USSR. The collection pertains to different branches of electrochemical kinetics, double layer theories and galvanic processes in metal electrodeposition and industrial electrolysis. Abridged discussions are given at the end of each division. The majority of reports not included here have been published in periodical literature. No personalities are mentioned. References are given at the end of most of the articles.

Smirnov, M.V., and L.D. Yushina (Uralskiy filial AN SSSR-Ural Branch, Academy of Sciences, USSR). Cathodic Processes During the Precipitation of Thorium From Fused Electrolytes   348

Guldin, I.T., and A.V. Buzhinskaya (Gosudarstvennyy nauchno-issledovatel'skiy institut tsvetnykh metallov-State Scientific Research Institute of Nonferrous Metals). Mechanism of the Reduction of Galena From Suspensions in Fused Mixtures of Magnesium and Sodium Chlorides at a Liquid-Lead Cathode   352

Panchenko, I.D. (Institut obshchey i neorganicheskoy khimii AN USSR-Institute of General and Inorganic Chemistry, Academy of Sciences, UkrSSR). Equation for a Polarographic Wave at Solid Electrodes in Fused Salts   355

Chovnyk, N.G. (Aviatsionnyy institut Kuybyshev-Aviation Institute, Kuybyshev). Some Problems of the Polarography of Fused Electrolytes   358

Vaysburd, S. Ye., and V.L. Kheyfets (Gosudarstvennyy institut

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po proyektirovaniyu predpriyatiy nikelevoy promyshlennosti-State Institute for the Planning of Enterprises of the Nickel Industry). Decomposition Voltage and Properties of Slags Used in Nonferrous Metallurgy   362

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PART V.   THE ELECTRODEPOSITION OF METALS   369

Maishev, R. ....   (.......... of Sciences).
(Physical Institute of the Bulgarian Academy of Sciences). Spiral Growth and Overvoltage During the Electrocrystallization of Silver   371

Bockris, J. O'M., V. Mil, and B.E. Conway (U.S.A.). Determination of Faraday Impedance at Solid Electrodes and Phases Which Determine Rate During the Electrodeposition of Copper   380

Vargamyan, A.T. Nonhomogeneity of an Electrode Surface and

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the Mechanism of the Electrodeposition of Metals   395

Polukarov, Yu. M., and K.M. Gorbunova (Institute of Physical Chemistry, Academy of Sciences, USSR). Some Theoretical

SMIRNOV, M.V.

Chemical form of the motion of matter. Part 1: Determination of the chemical form of the motion of matter. Filos. vop. fiz.i khim. no. 1:73-82 '59.   (MIRA 14:2)
(Motion)   (Chemical affinity)   (Matter)

SMIRNOV, M.V.; IVANOVSKIY, L.Ye.

Electrolysis of the chloridizing bath with anodes of titanium
oxide. Titan i ego splavy no.2:100-102 '59.
(MIRA 13:6)

1. Institut khimii Ural'skogo filiala AN SSSR.
       (Titanium--Electrometallurgy)

SOV/62-59-2-10/4?

5(4)
AUTHORS: Smirnov, M. V., Yushina, L. D.

TITLE: Equilibrium Potentials of Metals in Molten Electrolytes
                (Ravnovesnyye potentsialy metallov v rasplavlennykh
                elektrolitakh) Communication 1. Equilibrium Potentials of
                Thorium in Chloride Melts (Soobshcheniye 1. Ravnovesnyye
                potentsialy toriya v khloridnykh rasplavakh)

ABSTRACT: In the present paper the authors present the determination
               results of equilibrium potentials of thorium in equimolar
               mixture of sodium- and potassium chlorides both with and
               without thorium-chloride addition. The equilibrium potential
               of thorium in chloride melts which contained in the initial
               state 0.14 up to 78% $ThCl_4$ was measured in the temperature
               range of 680 - 825° (Fig 2). In order to determine the change
               of the electromotive force with the varying concentration
               of $ThCl_2$ in the melt, isothermal lines were drawn (Fig 3).
               The molten mixtures of sodium- and potassium chloride with
               thorium dichloride behave in all concentrations of $ThCl_2$ like
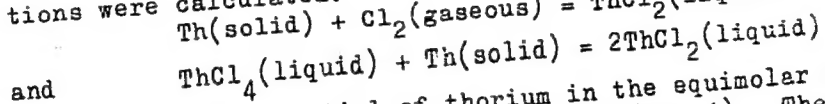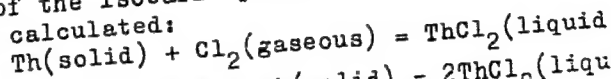
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Equilibrium Potentials of Metals in Molten
Electrolytes. Communication 1. Equilibrium Potentials
of Thorium in Chloride Melts

ideal solutions. A dependence of the equilibrium potential
of thorium on temperature and concentration was found.
According to experimental data the oxidation-reduction
potential of thorium in chloride melts as well as the equili-
brium constant of the reaction was calculated:

$$Th^{4+}(melt) + Th \rightleftarrows 2Th^{2+} (melt).$$
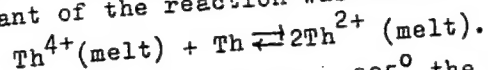
In the temperature range of $680 - 825^\circ$ the equilibrium constant
varies from 51.1 up to 0.91. According to the temperature
dependence of the electromotive force of galvanic elements
with the melt containing thorium dichloride the quantities
of the decomposition voltage of the molten $ThCl_2$ and the
variation of the isobaric potential for the following reac-
tions were calculated:

$$Th(solid) + Cl_2(gaseous) = ThCl_2(liquid$$

and $$ThCl_4(liquid) + Th(solid) = 2ThCl_2(liquid)$$

The stationary potential of thorium in the equimolar mixture
KCl + NaCl at $700 - 842^\circ$ was determined (Fig 4). There are

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SOV/62-59-2-10/

Equilibrium Potentials of Metals in Molten
Electrolytes. Communication 1. Equilibrium Potentials
of Thorium in Chloride Melts

4 figures and 12 references, 9 of which are Soviet.

ASSOCIATION: Ural'skiy filial Akademii nauk SSSR (Ural Branch of the
Academy of Sciences, USSR)

SUBMITTED: March 18, 1957

Card 3/3

SOV/78-4-1-30/46

5(2), 5(4)
AUTHORS: Tsiovkina, L. A., Smirnov, M. V.
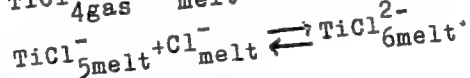
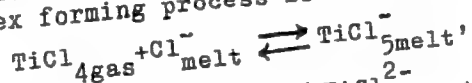TITLE: The Influence of the Nature of Cations and Anions on the
              Solubility of Titanium Tetrachloride in Salt Melts
              (Vliyaniye prirody kationov i anionov na rastvorimost'
              tetrakhlorida titana v solevykh rasplavakh)

ABSTRACT: The solubility of titanium tetrachloride in melts of LiCl,
              KCl, CsCl, NaCl-KCl, and an equimolar mixture of NaCl-KCl
              with additions of 10, 15, and 20 wt.% NaF was examined at
              $650 - 800°$. The dependence of the solubility of $TiCl_4$ on
              the nature of the cations in the melt shows a solubility
              increase in the direction from LiCl to CsCl. The solubility
              increase is caused by the formation of complex anions. The
              complex forming process is indicated by the following reactions:

              $$TiCl_{4gas} + Cl^-_{melt} \rightleftharpoons TiCl^-_{5melt},$$

              $$TiCl^-_{5melt} + Cl^-_{melt} \rightleftharpoons TiCl^{2-}_{6melt}.$$

Card 1/2

The Influence of the Nature of Cations and Anions   SOV/78-4-1-30/48
on the Solubility of Titanium Tetrachloride in Salt Melts

The dependence of the solubility of titanium tetrachloride
in the melt of NaCl-KCl(1:1) on the temperature and the
dependence of the solubility of the NaF concentration was
investigated.   In melts with fluorine ions the solubility of
$TiCl_4$ increases with the formation of titanium fluorine com-
plex TiF_6^{2-}.   The complex ion TiF_6^{2-} has a higher temperature
stability than the ion $TiCl_6^{2-}$.   There are 6 figures and 13
references, 1 of which is Soviet.

SUBMITTED: October 28, 1957

Card 2/2

5(2)
AUTHORS: Smirnov, M. V., Chukreyev, N. Ya.

TITLE: The Behavior of Beryllium in Fused Salt Baths in the Presence
               of Metallic Beryllium

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 11,
               pp 2536 - 2543 (USSR)

ABSTRACT: Alkaline- earth metals are dissolved in their chlorides under
               the formation of subchlorides. The authors found also for
               beryllium (Ref 3) that the Be^+ ion is present in chloride
               melts in addition to the Be^{2+} ion. In order to confirm this re-
               sult, the reaction of metallic Be in alkali-chloride melts is
               investigated here within the temperature range 351-600°. The
               reaction $Be^{2+}+Be=2Be^+$ is measured by variation of the redox
               potential of a molybdenum electrode. The redox potential varied
               by 1.3 v, and thus allowed for the determination of the smallest
               Be^+ quantities. To make sure whether this was really a varia-
               tion of the redox potential of the molybdenum electrode, the
               authors compared the potentials of the molybdenum electrode
               and the beryllium electrode with those of a chlorine electrode
               (Table 1). The Be electrode had a constant potential of -2.44 v

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05871
SOV/78-4-11-24/50

The Behavior of Beryllium in Fused Salt Baths in
the Presence of Metallic Beryllium

whereas the potential of the Mo electrode dropped from -1.13 v
to - 1.82 v. Figure 1 shows the course of the redox potential
during the experiments which were extended to 30 h. The
potentials of the Mo and Be electrode could not be fully com-
pensated because the surface of the latter was passivated. The
weight loss of the Be anode was measured for the purpose of
determining the equilibrium constant of the reaction
$Be^{2+} + Be \rightleftharpoons 2 Be^{+}$. The scheme of figure 2 shows the apparatus
used. A eutectic LiCl-KCl melt served as electrolyte, the anode
and cathode space were separated by a BeO pot, and the cathode
was made of molybdenum wire. Results of 20 experiments are
listed in table 2. As the Be anode corrodes in addition to
the anodic dissolution of Be, the authors determined the disso-
lution rate of Be in chloride melts at the same experimental
temperatures (Fig 3). The results corrected in consideration
of the corrosion of Be in chloride melts and the equilibrium
constant calculated for the experimental temperatures are listed
in table 3. Figure 4 shows the temperature dependence of the
equilibrium constant which satisfies the empirical equation

Card 2/3

SOV/20-127-5-37/58

5(4)
AUTHORS: Smirnov, M. V., Chukreyev, N. Ya.

TITLE: The Redox Potential of the System Be^+/Be^{++} in a Melt of Alkali Metal Chlorides

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 5, pp 1066-1069 (USSR)

ABSTRACT: In preceding papers (Refs 1,2) the authors found that in chloride melts which are in contact with metallic beryllium, besides Be^{++}- also Be^+-ions are contained. There follows the determination of E^o_{Be/Be^+}, $E^o_{Be/Be^{++}}$, and $E^o_{Be^+/Be^{++}}$ on the basis of the corresponding thermodynamic equations for the equilibrium potentials of Be and its mono- and bivalent ions, and the determination of the redox potential of the system Be^+/Be^{++} in salt melts. Measurement of the equilibrium potential was carried out in a temperature interval 380-940° in a measuring cell, which is shown by figure 1. As an electrolyte, an eutectic melt of LiCl and KCl in argon atmosphere was used. Figure 2 shows the variation of the electromotive force of the cell Be | $BeCl_2$, LiCl, KCl | Cl_2C with temperature. The isothermal line of the equilibrium potential of the beryllium electrode

Card 1/2

The Redox Potential of the System Be^+/Be^{++} in a Melt of Alkali Metal Chlorides

$(E - \lg [Be]$, Fig 3) calculated on the basis of the experimental data, confirms that the melt contains Be^+-ions, the concentration of which decreases with increasing temperature. Table 1 shows the results of calculation for melts with different beryllium content in the temperature interval $700 - 1200^{\circ}K$. Figure 4 shows the temperature dependence for E^o_{Be/Be^+} and $E^o_{Be/Be^{++}}$.

Empirical equations are written down for this temperature dependence, and the constants of the thermodynamic equation for the redox potential of the system Be^+/Be^{++} are calculated. There are 4 figures, 1 table, and 3 Soviet references.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR (Institute of Electrochemistry of the Ural Branch of the Academy of Sciences, USSR)

PRESENTED: April 13, 1959 by A. N. Frumkin, Academician

SUBMITTED: April 13, 1959

Card 2/2

S/631/60/000/001/001/014
B101/B147

AUTHOR: Smirnov, M. V.

TITLE: Residual currents and cathodic current yield in the electrolysis
            of salt melts

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov,
            no. 1, 1960, 3-6

TEXT: Previous studies on the electrodeposition of Be (ZhFKh, $\underline{32}$, 2174,
1958), Th (Izv. AN SSSR, OKhN, 1285, 1956), Ti (Izv. Sibirskogo otd.
AN SSSR, 1960), Zr and Hf have shown that a charge reversal of ions to
subions occurs: $Me^{z+} + ne = Me^{(z-n)+}$. The metal deposition sets in as
soon as the concentration of these ions in the electrolyte layer close to
the cathode corresponds to the equilibrium between them and the salt melt.
The charge reversal produces a residual current. The cathodic potential
φ is given by $\varphi = E^{o}_{Me^{(z-n)+}/Me^{z+}} + (RT/nF)\ln\left\{nFD_{Me^{(z-n)+}}[Me^{z+}]/\delta i\right\}$

Card 1/3

S/631/60/000/001/001/014
B101/B147

Residual currents and cathodic...

$- D_{Me^{(z-n)+}}/D_{Me^{z+}}\}$, where $E^o_{Me^{(z-n)+}/Me^{z+}}$ is a constant of the thermo-dynamical equation of the redox potential, $D_{Me^{z+}}$, $D_{Me^{(z-n)+}}$ are the diffusion constants of the ions in the melt, δ is the thickness of the diffusion layer on the cathode, $[Me^{z+}]$ is the molar part concentration of the metal ion with ordinary valence in the melt. The residual current caused by the cathodic charge reversal can now be written as

$$i_{res} = nFD_{Me^{(z-n)+}}[Me^{z+}]/\delta\left\{\exp\left[(nF/RT)(\varphi - E^o_{Me^{(z-n)+}/Me^{z+}})\right] + D_{Me^{(z-n)+}}/D_{Me^{z+}}\right\}.$$

i_{res} reaches a limit when the deposition of the metal begins $(\varphi = E^{equ}_{Me} = const)$. The ratio of the molar part concentration of the ions remains also constant: $[Me^{(z-n)+}]_s/[Me^{z+}]_s^{(z-n)/z} = K$. If no metal is lost by side reactions on the cathode the current yield is given by $\eta = 1 - i_{res}/i$. If the accumulation of ions of low valency is prevented by

Card 2/3

BARABOSHKIN, A.N.; SMIRNOV, M.V.

Time necessary to attain a steady state in electrolysis with
a constant current intensity. Trudy Inst.elektrokhim.UFAN
SSSR no.1:7-16 '60.   (MIRA 15:2)
                          (Salts)
                        (Electrolysis)

S/631/60/000/001/002/014
B101/B147

AUTHORS: Komarov, V. Ye., Smirnov, M. V., Baraboshkin, A. N.

TITLE: Equilibrium potentials of zirconium in a fused equimolar mixture of sodium chloride and potassium chloride

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov, no. 1, 1960, 17-22

TEXT: Measurements were made at 687-978°C in an equimolar NaCl + KCl melt with 0.16-6.8 % by weight of Zr in an argon atmosphere in order to determine the temperature coefficient of the equilibrium potentials of Zr with respect to the chlorine electrode and to clarify the effect of cations on this coefficient. The emf between Zr and Cl was found to be

$\epsilon_1 = 2.560 - 3.62 \cdot 10^{-4} T \pm 0.005$ v for 0.16 % by weight of Zr;

$\epsilon_2 = 2.587 - 4.72 \cdot 10^{-4} T \pm 0.002$ v for 1.24 % by weight of Zr;

$\epsilon_3 = 2.600 - 5.43 \cdot 10^{-4} T \pm 0.003$ v for 6.8 % by weight of Zr. Taking into

account the thermo-emf between the carbon current lead to the chlorine

Card 1/4

Equilibrium potentials of zirconium in...

electrode and the molybdenum lead to the zirconium electrode, the following equilibrium potentials are obtained: $E_1 = -2.552 + 3.45 \cdot 10^{-4} T$ v; $E_2 = -2.579 + 4.55 \cdot 10^{-4} T$ v; $E_3 = -2.592 + 5.26 \cdot 10^{-4} T$ v. Owing to the reaction $Zr^{4+}_{melt} + Zr \rightleftharpoons 2Zr^{2+}_{melt}$ (1) the isothermal lines are not linear. At low Zr concentrations, the equilibrium constant of this reaction is given by $K = (1 - x)^2 [Zr]/x$, where x = molar part of the Zr^{4+} ions. $1 - x$ = molar part of the Zr^{2+} ions, and $[Zr]$ = total concentration of Zr. The average valency of Zr at $[Zr] = 5.83 \cdot 10^{-4}$ is approximately 2. For $[Zr] = 2.46 \cdot 10^{-2}$ it is 2.36 at 1000°K and 2.28 at 1200°K. $\Delta H^{o}_{ZrCl_2} = -112.3$ kcal/mole was found in an LiCl + KCl melt, whereas $\Delta H^{o}_{ZrCl_2}$ amounts to -117.7 kcal/mole for the NaCl + KCl melt. This difference is due to the interaction of Zr^{2+} with chlorine ions in the

Card 2/4

Equilibrium potentials of zirconium in...

Assuming a latent heat of fusion of $ZrCl_4$ equal to 9.0 kcal/mole, the heat of formation of $ZrCl_6^{2-}$ ions in the melt is found to be -16 kcal/mole. A paper of I. S. Morozov, D. Ya. Toptygin (Izv. AN SSSR, OKhN, 1920, 1959) is mentioned. There are 4 figures, 1 table, and 10 references: 6 Soviet and 4 non-Soviet. The four references to English-language publications read as follows: E. M. Larsen, J. J. Leddy, J. Am. Chem. Soc., 78, 5983, 1956; P. Gross, C. Hayman, D. L. Levi, Trans. Farad. Soc., 53, 1285, 1957; A. A. Palko, A. D. Ryon, D. W. Kuhn, J. Phys. Chem. 62, 319, 1958; L. Jang, R. G. Hudson, Trans. Metallurg. Soc. AIME, 215, 589, 1959.

Card 4/4

S/631/60/000/001/003/014
B140/B110

Thermodynamics of formation of the ...

$\Delta\varepsilon > 0$, the greater part of titanium is bound to the fluorine complex, with $\Delta\varepsilon < 0$, to the chlorine complex. TiO_2 - C electrodes were produced from pure TiO_2 for the experiment. TiO_2 was mixed with concentrated, aqueous glucose solution. The mixture was evaporated and the residue pulverized. Cylindrical electrodes were molded from the powder and heated at $800^\circ C$ with exclusion of air. The pyrolysis of glucose yielded carbon forming a homogeneous mixture with the oxide. An analysis of the electrode yielded 52.39% Ti and 1.64% C. The following reaction proceeeded on this electrode: $TiO_2 + C - 3e \rightarrow Ti^{3+}$. Ti^{3+} ion saturation in the electrolytic layer near the cathode gives a constant potential. At first, an equimolecular NaCl and KCl mixture was used as electrolyte. 0.50% by weight NaF was added in a second series of experiments. With higher NaF content, the TiO_2 - C electrode was destroyed. The melt was subjected to reduced pressure for 1 hr. and the gas room filled with CO_2 and CO to fix a constant oxygen activity in the system. The chlorine electrode was

Card 2/4

Thermodynamics of formation of the ...   S/631/60/000/001/003/014
                                            B140/B110

$\Delta Z = -27\ 190 - 27.513\ (1.694 + \log\ [F^-]) \cdot T + 550$ cal/g-ion;
$\Delta H = -27.2$ kcal/g-ion; $\Delta S = 27.513\ (1.694 + \log\ [F^-])$. ΔS changes its
sign at $[F^-] = 2,07 \cdot 10^{-3}$. For a lower concentration, $\Delta S < 0$. For a higher,
$\Delta S > 0$. The decrease in entropy with decreasing fluorine ion concentration
may be explained by the arrangement of fluorine ions around titanium
cations. There are 2 figures and 12 references: 7 Soviet and 5 non-Soviet.
The three references to English-language publications read as follows:
N. F. H. Bright, J. F. Rowland, R. H. Lake. Can. Dept. Mines and Tech.
Surveys, Mines Branch Rept. N MD 196; J. G. Wurm, L. Gravel, R. J. A.
Potvin. J. Electrochem. Soc., 104, 301, 1957; W. C. Kreye, H. H. Kellog,
J. Electrochem. Soc., 104, 504, 1957.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala AN SSSR
               (Institute of Electrochemistry of the Ural Branch AS USSR)

Card 4/4

Behavior of anodes of an intimate ...

S/631/60/000/001/004/014
B140/B110

low current density ($1 \cdot 10^{-4}$ - $1 \cdot 10^{-3}$ a/cm^2), the potential changes little, but it rises quickly at higher current densities. The redox potential of Ti^{4+}/Ti^{3+} in the chloride melt is -0.8 v. Hence, it is concluded that Ti^{3+} passes into the electrolyte since $\left[Ti^{4+}\right]/\left[Ti^{3+}\right] \approx 10^{-2}$. The following reaction takes place: $TiO_2 + C - 3e = Ti^{3+}_{(m)} + CO_2$ (m = melt). The Ti ions enter the melt, like the low Ti oxides. Anodic dissolution depends on O_2 diffusion from the electrolyte to the TiO_2 - C electrode. The anode current density can only be increased when the discharged chlorine ions react with the TiO_2 - C electrode. 11,000 TiO_2 particles fall to 1 cm^2 of electrode surface. The effective cross section of the oxide layer was $3.22 \cdot 10^{-3}$ cm, its resistance $R \approx 1$ ohm. The high polarization observed is due to the change in O_2 concentration on the surface of oxide particles in contact with the melt, and in the concentration of Ti ions

Card 2/4

Behavior of anodes of an intimate ...

S/631/60/000/001/004/014
B140/B110

1 non-Soviet.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk
SSSR (Institute of Electrochemistry of the Ural Branch of
the Academy of Sciences USSR)   .

SUBMITTED: 1960

Card 4/4

S/631/60/000/001/005/014
B117/B147

AUTHORS: Smirnov, M. V., Krasnov, Yu. N.

TITLE: Oxide - carbon anodes with lowest titanium oxides in
             electrolysis of chloride melts

SOURCE: Elektrokhimiya rasplavlennykh solevykh i tverdykh
             elektrolitov, no. 1, 1960, 35-41

TEXT: The behavior of oxide - carbon anodes with lowest metal oxides was
investigated. For this purpose, the polarization of titanium monoxide
and titanium sesquioxide - carbon anodes was studied, and the products of
electrolysis at various current densities were determined. An equimolar
melt of sodium and potassium chlorides was used as electrolyte. The
polarization of titanium monoxide - carbon anodes was measured at 740 and
830°C, that of titanium sesquioxide - carbon anodes at 730 and 805°C.
The authors found that the potentials of oxide - carbon anodes and the
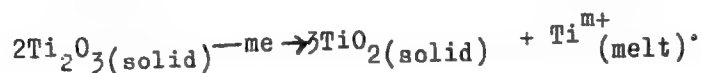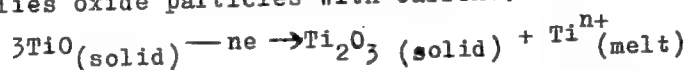corresponding oxide anodes at current densities below 1 a/cm^2 (with

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$TiO+C$) and 0.5 a/cm^2 (with Ti_2O_3+C) were similar. The only difference
is that the former potential increases with the current density much more
rapidly than the latter. It is also characteristic that the precipita-
tion of carbon dioxide on oxide - carbon anodes with TiO and Ti_2O_3 sets
in not at the beginning of electrolysis as with TiO_2+C, but later, and
the more so the lower the current density. Gas separation sets in more
rapidly on anodes with Ti_2O_3 under otherwise equal conditions.

Experimental data allow definite conclusions on processes during the
electrolysis of salt melts on oxide - carbon anodes with TiO and Ti_2O_3.

These anodes first dissolve like oxide anodes without carbon participation
which only supplies oxide particles with current:

$$3TiO_{(solid)} - ne \rightarrow Ti_2O_3 \text{ (solid)} + Ti^{n+}_{(melt)}$$

$$2Ti_2O_3_{(solid)} - me \rightarrow 3TiO_2_{(solid)} + Ti^{m+}_{(melt)}.$$

Card 2/4

Oxide - carbon anodes with lowest ...

In the case of electrodes with TiO, the first electrode reaction takes place at current densities not higher than 0.2 - 0.3 a/cm^2 if their potential is more negative than -1.5 v. At higher current densities and more positive potentials, a new phase of changing Ti_2O_3 composition forms which yields titanium ions in the melt corresponding to the second electrode reaction. The fact that carbon does not participate in electrode reactions agrees with thermodynamical calculations. Summary: Electrolysis with Ti_2O_3+C anodes, without gas separation at its beginning suggests that carbon does not participate in the dissolution which proceeds therefore like that with a pure Ti_2O_3 anode. If the oxygen content of the surface layer of sesquioxide approaches its maximum (the anode potential reaching -1.3 to -1.2 v referring to the chlorine electrode), carbon starts participating in the process. If the current density is increased, the second reaction prevails. The polarization curve shows a salient point and a new wave. The latter lies in the same potential range as with TiO_2+C anodes but at a higher current density.

Card 3/4

Oxide - carbon anodes with lowest ...

S/631/60/000/001/005/014
B117/B147

At maximum diffusion current, further increase of anodic current density is only possible at the expense of a discharge of chlorine ions, which are adsorbed on carbon particles and then participate in the chlorination of the oxide - carbon mixture. An ever-increasing portion of tetravalent titanium passes over into the electrolyte as the anode potential increases. The ratio of tri- and tetravalent titanium is determined by the redox potential according to the thermodynamic equation

$$E = E^0_{Ti^{3+}/Ti^{4+}} + RT/F \ln (Ti^{4+})/(Ti^{3+})$$

There are 4 figures and 5 Soviet references.

Card 4/4

Electrochemical Behavior of Titanium Carbide   S/078/60/005/06/08/030
in Chloride Melt   B004/B014

dependence between the current yield for titanium on the current density
D_a at 500°C. With $D_a > 0.1$ a/cm^2 mainly $TiCl_4$ is formed, which is sublimated
from the melt. Fig. 2 represents the polarization of the titanium carbide
anode at 530, 650, and 800° ($D_a = 5.10^{-4}$ to 1 a/cm^2) in the coordinates
log i, φ (φ = potential referred to a chlorine electrode). The authors
discuss the low polarization at small D_a, which they ascribe to diffusion
of titanium from the interior of the electrode toward the surface. The
respective equations are written down. The decomposition of the carbide
anode starts at potentials which, depending on D_a and temperature, are
0.5 - 1.4 v more negative than the potentials of chlorine separation, and
are accompanied by a polarization of 0.5 - 0.65 v. Fig. 3 shows the tem-
perature dependence of the potential of the TiC-C electrode with respect
to a Cl electrode. Moreover, the authors discuss the system Ti - C, which
below 900°C consists of the metallic α-phase with less than 1 per cent
of C and the δ-carbide phase with 13 - 20 per cent of C. The emf of the
cell Ti/TiCl$_2$,TiCl$_3$,LiCl,KCl$_{melt}$/Ti$_{1+x}$C between 425 and 725°C and its

Card 2/3

67945

S/020/60/130/03/027/065
B004/B011

5.4700
$5.2200(A)$

5(4)

AUTHORS: Smirnov, M. V., Nichkov, I. F., Raspopin, S. P., Perfil'yev, M. V.

TITLE: Investigation of the <u>Thermodynamics</u> of the Reaction $UO_2(s) + \frac{1}{2}C(gr) + Cl_2(g) = UOCl_2(s) + \frac{1}{2}CO_2(g)$ by Means of the Method of Electromotive Forces

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 3, pp 581-584 (USSR)

ABSTRACT: It had been stated in earlier papers (Refs 1-3) that electrodes pressed from metal oxides and carbon are reversible with respect to the corresponding cation in chloride melts. This allows their utilization for investigating the thermodynamic processes and some reactions by measuring the emf. The authors had found in reference 1 that $ThOCl_2$ in melts of chlorides or chlorides and fluorides are practically insoluble. They accepted this for $UOCl_2$ as well and investigated the reaction between uranium dioxide carbon electrodes and melts of alkali chlorides containing UCl_4. By measuring the temperature de-

Card 1/4

67945

S/020/60/130/03/027/065
B004/B011

Investigation of the Thermodynamics of the
Reaction $UO_2(s) + \frac{1}{2}C(gr) + Cl_2(g) =$
$UOCl_2(s) + \frac{1}{2}CO_2(g)$ by Means of the Method of Electromotive Forces

occurred the earlier, the higher the temperature and the UCl_4
content in the melt (Fig 2). With high UCl_4 content in the
melt, the electrode is destroyed. The appearance of the equi-
librium potential corresponds to the reaction
$UO_2(s) + UCl_4(melt) \rightleftharpoons 2UOCl_2(s)$. Experimental data are on the
straight line $\varepsilon = (0.713 + 4.8 \cdot 10^{-4}T)v$ (Fig 3). Herefrom, the
authors calculated for the reaction

$UO_2(s) + \frac{1}{2}C(gr) + Cl_2(g) = UOCl_2(s) + \frac{1}{2}CO_2(g)$
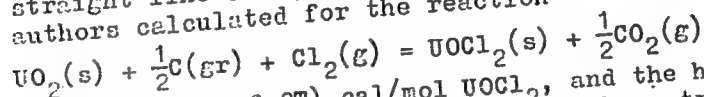
$\Delta Z = (-32900 - 2.2T)$ cal/mol $UOCl_2$, and the heat effect
$\Delta H = -32.9$ kcal/mol $UOCl_2$ as well as the entropy
$\Delta S = 2.2$ cal/degree.mol $UOCl_2$. The formation heat and the
entropy of the $UOCl_2$ were calculated on the strength of the
thermodynamic data offered in reference 9: $\Delta H^o_{UOCl_2} =$
$= -255.9$ kcal/mol, $S^o_{UOCl_2} = 49.2$ cal/degree.mol . The

Card 3/4

Smirnov, M V.

81869
S/020/60/133/02/45/068
B004/B064

5.4600

AUTHORS: Smirnov, M. V., Komarov, V. Ye., Baraboshkin, A. N.

TITLE: Equilibrium Potentials of Zirconium in Mixed Fluoride - Chloride Melts

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 2, pp. 409 - 412

TEXT: The authors carried out their investigations in equivalent mixtures from KCl + NaCl under addition of different amounts of fluorides at 700 - 950°C. The melt was produced from chemically pure salts, the zirconium being introduced by means of anodic dissolution of its iodide into the melt directly in the test cell (Fig. 1). Argon served as protective atmosphere. The potentials of melts 0.17 up to 1.05 wt% Zr and up to 15.82 wt% F were measured. The molar ratio of concentration [F]/[Zr] was varied between 9 and 75. The experiments showed that the potential of Zr is more strongly influenced by the concentration of fluorine than by its own concentration. A reaction equation is written down for the formation of the zirconium - fluoride complexes, in which

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B004/B064

Equilibrium Potentials of Zirconium in Mixed Fluoride - Chloride Melts

the number of F ions that are bound to Zr as complexes is designated with m, the average valency of Zr with n. The equation $E = const - 1.984 \cdot 10^{-4} T \log [F^-]$ is set up for the dependence of the potential on the concentration of the free fluorine ions. It was checked at 770°C, variation of the fluorine content of 2.04 to 15.82 wt% and constant Zr concentration of 1.05 ± 0.2 wt%. The graphical representation of the experimental data (Fig. 2) yields for m = 6,5,4 straight line, for which empirical equations are written down. The change of m and n is discussed and the following found: $4 \geqslant n > 2,5$. Formation of different ions at $[F]/[Zr] > 10$ and $[F]/[Zr] < 10$. Fig. 3 shows the results of experiments at temperatures of from 500 to 1250°K for five melts with $[F]/[Zr]$ from 45 to 9, for which also empirical equations were written down. Assuming that in the case of 10 - 15 wt% Zr the fluoride - chloride melts behave in a similar way as if thorium were added (Ref. 3), the equation is written down for the equilibrium potential. In the case of an excessive quantity of fluorine $75 > [F]/[Zr] > 10$ as occurs in the practical electrolysis of fluorine zirconate, it holds that $4 > n > 3$ and $6 > m > 4$. For approximative

Card 2/3

SMIRNOV, M V.

report to be submitted for the IUPAC 21st Conference and 18th Intl. Congress of Pure and Applied Chemistry, Montreal, Canada, 2-12 ? ?41 1961

GORODISKIY, G. V., Academy of Sciences USSR, Kiev - "The oscillographic investigation of the electrochemical kinetics in fused salts" (Section A.3,c.2 - Session I, 11 Aug 61, afternoon)

CHENTSCH, L. V., Academy of Sciences USSR, Moscow - "The calculation of thermodynamic functions of gases in a wide temperature range" (Section A.3,c(1), Session II - 8 Aug 61, afternoon)

KARGIN, V. A., Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Vitrification phenomena in crystalline polymers" (Section B.4 - 7 Aug 61, afternoon)

KISELEV, A. V., Moscow State University imeni M. V. Lomonosov - "The influence of surface heterogeneity and adsorbate-adsorbate interaction on the adsorption properties of solid surfaces" (Joint Session, Sections A.2 and B.1 - 8 Aug 61, morning)

KONDRAT'YEV, V. N., Institute of Chemical Physics, Academy of Sciences USSR, Moscow - "The HO2 Radical" (Section A.1, Session I - 11 Aug 61, morning) (Also, Section A.1, Chairman, Session I - 8 Aug 61, morning)

KUZNETSOV, V. I., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "A novelty in the use of organic co-precipitants for concentration of small amounts of the elements" (To be presented in Russian) (Section C.2 - 11 Aug 61, morning)

LARIONOVA, A. K., RADCHENKO, E. D., and JOSVALEVA, L. P., Institute of Geochemistry and Analytical Chemistry imeni V. I., Vernadskiy, Academy of Sciences USSR - "New data on radiochemical investigations of the processes of fission and fragmentation induced by high energy protons" (Section A.4 - 8 Aug 61, afternoon)

LOVACHEV, L. A., Academy of Sciences USSR, Moscow - "Determination of rate constants of elementary processes from flame velocities" (Section A.3,b,(2) - 7 Aug 61, pressure, and molecular transfer coefficients (Section A.3,b,(2) - 7 Aug 61, afternoon)

MINDIATE, S, (probably MINDIATE, S.) and GERASIMOV, Y. I., Moscow State University imeni M. V. Lomonosov - "Study of the thermodynamic properties of the system iron-platinum" (Section A.3,c,(3), Session II(A) - 11 Aug 61, morning)

PANCHENKOV, G. M., KOLCHIN, A. M., NALADOV, V. F., and KUZIN, Ye., Moscow State University imeni M. V. Lomonosov - "Emission of complex ions in solid-phase reactions" (Joint Session, Sections A.2 and B.1, 8 Aug 61, morning)

SPOKOV, N. N., Institute of Chemical Physics, Academy of Sciences USSR, Moscow - "Certain chemical reactions at reduced temperatures and related problems of energy transfer" (To be presented in Russian) (Plenary lecture - Saturday, 12 Aug 61)

SHILOV, Ye. A., Academy of Sciences UkSSR, Kiev - "The active agents and the intermediary compounds in the heterolytic reactions of halogenation of the organic compounds" (Section A.1, Session II - 11 Aug 61, morning)

STROMOV, M. V., Electrochemistry Institute, Sverdlovsk - "The equilibrium between the titanium subgroup metals and the salt melts" (Section B.3 - 7 Aug 61, afternoon)

TAL'ROZE, V. L., Institute of Chemical Physics, Academy of Sciences USSR - "Reactions of ions and molecules in the gas phase" (Section A.1, Session I - 9 Aug 61, afternoon)

TERENIN, Aleksandr N., Leningrad State University imeni A. A. Zhdanov - (Section A.1, Chairman, Session I - 8 Aug 61, afternoon Session) (Also as program for Section A.1, Session I - 9 Aug 61, afternoon)

TERENIN, Aleksandr N., VILESSOV, F. I., KURBATOV, B., and DODONOVA, N./Leningrad State University imeni A. A. Zhdanov - "Mass-spectrometry and luminescence of radicals in the photodissociation and photoionization of molecules by vacuum ultra-violet radiation" (Section A.1, Session I - 9 Aug 61 - afternoon)

TUNITSKII, N. N., Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov - "On the dissociation of molecules on electron impact and the early states of radiation-chemical processes" (Section A.1, Session I - 8 Aug 61, afternoon)

VANYUKOVA, Zemanil Ye., and SEMOLEV, V. V., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Moscow - (Section C.1 - 8 Aug 61, morning) its use for spectral analysis of alloys and rocks" (Section C.1 - 8 Aug 61, morning)

VINOGRADOV, A. P., LAVRUKHINA, A. K., and REVINA, L. D., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "The study of nuclear reactions in iron meteorites under the action of high energy protons" (Section A.4 - 8 Aug 61, afternoon)

YAKOVLEV, Ya V., and ALIMARIN, I. P., Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR - "The determination of trace impurities in some materials for semiconductor technique by radio-activation analysis" (To be presented in Russian) (Section C.1 - 8 Aug 61, afternoon)

YEROFEYEV, Boris V., Institute of Physical-Organic Chemistry, Minsk - "The effect of donor and acceptor admixtures on the decomposition rate of solids" (Section A.2 - 8 Aug 61, afternoon)
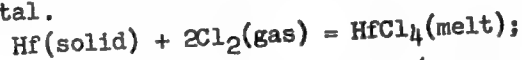
S/137/62/000/009/002/033
A006/A101

Equilibrium between hafnium metal and...

scale versus equilibrium Hf potentials, are not straight lines. The bending of isotherms is caused by the presence of ions of different valences in the commensurable quantities. The magnitude of mean Hf valence in the electrolyte at different concentrations is determined from the inclination of tangents to the isotherms. Equations are found for the temperature dependence of equilibrium constants of the reaction $Hf_{(melt)} + Hf = 2Hf^{2+}_{(melt)}$ and standard values of electrode potentials:

$$lg\ K = -0.329 - 2820\ T,$$

$$E^{o}_{Hf/Hf^{2+}} = -2.51 + 6.3 \cdot 10^{-4}\ Tb; \quad E^{o}_{Hf/Hf^{4+}} = -2.65 + 6.2 \cdot 10^{-4}\ Tb;$$

$$E^{o}_{Hf^{2+}/Hf^{4+}} = -2.79 + 6.0 \cdot 10^{-4}\ Tb.$$ The authors calculated changes in the isobaric potential Δz at reactions of $HfCl_4$ and $HfCl_2$ formation and $HfCl_4$ reduction in $HfCl_2$ by hafnium metal.

$$Hf(solid) + 2Cl_2(gas) = HfCl_4(melt);$$

$$\Delta z = -245,000 + 55.0\ T\ cal/mole$$

$$Hf(solid) + Cl_2(gas) = HfCl_2(melt);$$
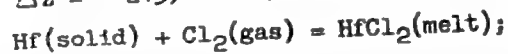
Card 2/3

40820

S/631/61/000/002/001/013
I003/I203

21.4100

AUTHORS: Skiba, O. V., and Smirnov, M. V.

TITLE: Equilibrium potentials of uranium in fused NaCl-KCl mixtures

SOURCE: Akademiya nauk SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no. 2, 1961,
             Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov.3–9

TEXT: None of the recent papers on the equilibrium potentials of uranium in fused chloride salts mention its temperature dependence. Equilibrium potentials of uranium in equimolar NaCl–KCl mixtures containing from 0.5 to 27.2 wt % of UCl_3 were measured against a chlorine reference electrode in the temperature range from 700 to 930°C. Within the concentration limits investigated it was found that the equilibrium potential of uranium may be calculated from the Nernst equation: $E = E^{\circ}v/v^{3+} + \frac{2.3RT}{3F}\log[v^{3+}]$. The temperature dependence of the value $E^{\circ}v/v^{3+}$ measured against a chlorine reference electrode is expressed by the equation: $E^{\circ}_{u}v/v^{3+} = 3.010 + 6.65.10^{-4}T$. The temperature dependence of the equilibrium constant of the reaction $2U + 3Th^{2+}_{soln} \leftrightarrows 3Th + 2U^{3+}_{soln}$ is expressed by $\log K = \log \frac{[v^{3+}]^2}{[Th^{2+}]^3} = 11,342 - \frac{5564}{T}$. There are 3 figures.

Card 1/1

40822

S/631/61/000/002/003/013
I003/I203

5.4700

AUTHORS: Komarov, V., and Smirnov, M. V.

TITLE: Equilibrium potentials of hafnium in mixed fluoride-chloride melts

SOURCE: Akademiya nauk SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no. 2 1961,
Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov. 19–22

TEXT: The formation of stable hafnium-fluorine complexes in the above salts can be deduced from the
results of equilibrium potential measurements of hafnium and from the fact that no solid phase of any haf-
nium compound containing fluorine is formed when NaCl–KCl fused salts containing up to 3.4 wt % of
Hf and up to 35 wt % of NaF are heated between 700 and 900°C. The equilibrium potentials of hafnium
were measured against a chlorine reference electrode in NaCl–KCl fused salts containing from 0.99 to 3.4
wt % of Hf and 1.36 to 15.8 wt % of fluorine at 700, 800, and 900°C. Formulas representing the temperature
dependence of the equilibrium potential and of the instability coefficent of the HfF_6^{2-} ion are given. There
are 2 figures.

Card (1/1)   1) REFERENCE S/631/61/002/002/013

S/137/62/000/008/008/065
A006/A101

AUTHORS: Smirnov, M. V., Loginov, N. A., Tsiovkina, L. A.

TITLE: Behavior and equilibrium potentials of titanium in mixed fluoride-
chloride melts

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 8, 1962, 21 - 22, abstract
8G160 ("Tr. In-ta elektrokhimii. Ural'skiy fil. AN SSSR", 1961,
no. 2, 29 - 40)

TEXT: The authors studied interaction of Ti metal with fluoride-chloride
melts containing Ti in 3- and 4-valent state. It is shown that in the presence
of an excessive amount of alkali-metal fluoride, a Ti^{2+} compound is being formed
whose composition is Me_2TiF_4 and which is poorly soluble in molten mixtures of
alkali-metal chlorides and fluorides. It is found that the behavior of a Ti-
electrode in mixed fluoride-chloride melts is like the behavior of a second-type
electrode; its potential does not depend upon the nominal Ti content in the
electrolyte and is wholly determined by the concentration of fluor ions $[F^-]$
according to equation $E = -2.66 - 4.10 \cdot 10^{-4} \ T - 3.97 \cdot 10^{-4} \ Tlg \ [F^-]^b$ in relation

Card 1/2

40824

S/631/61/000/002/005/013
I003/I203

5.4700

AUTHORS   Smirnov, M. V., Baraboshkin, A. N., Saltykova, N. A., and Komarov, V. Ye

SOURCE: Akademiya nauk SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no 2, 1961.
               Elektrohimiya rasplavlennykh solevykh i tverdykh elektrolitov. 63-69

TITwE   Cathodic processes during deposition of hafnium from chloride and hloride-fluoride
               fused salts

TEXT: There are no pablished data on the electrode processes of the electrolysis of fused salts containing hafnium. The cathodic polarization of molybdenum and tungsten in chloride and and chloride-fluoride fused salts containing hafnium was invastigated by measuring their electrode potentials against a chlorine reference electrode. Current densities were from 10^{-4} to 2 amp/cm^2 and the temperature range from 700 to 900°C. Hafnium was introduced into the fused salts by addition of hafnium tetrachloride or by anodic dissolution of the pure metal in the bath. The presence of fluorine ions in fused chloride salts decreases the deposition potentials of hafnium and decreases the concentration polarization, particularly when the F/Hf molar ratio is 6. There are 5 figures

Card 1/1

40826

S/631/61/000/002/008/013
I003/I203

21.4100

AUTHORS: Nichkov, I. F., Raspopin, S. P., and Smirnov, M. V.

TITLE: The polarization of carbon-dioxide uranium anodes in melts of alkali metals chlorides

SOURCE: Akademiya nauk SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no. 2, 1961, Elektro-khimiya rasplavlennykh solevykh i tverdykh elektrolitov. 91-95

TEXT: This work was undertaken to determine the highest current density at which $UOCl_2$ forms and to find the products of the anodic dissolution of carbon dioxide uranium anodes at higher current densities. The polarization of these anodes in an equimolar mixture of fused sodium and potassium chlorides at current densities from 10^{+4} to 10 a/cm^2 was investigated at 700 and 800°C. The electrolytic processes change with increasing current density in the following order: 1) formation of $UOCl_2$; 2) dissolution of uranium oxychloride and uranium dioxide or their chlorination, resulting in the passage of U^{4+} ions into the solution; 3) dissolution of uranium dioxide and the passage of UO_2^{2+} ions into the solution without the participation of carbon, and finally; 4) the evolution of gaseous chlorine. There is 1 figure.

Card 1/1

21119

18/215   1087, 1521 also 1208, 1160

AUTHORS: Nichkov, I. F., Smirnov, M. V.

TITLE: Electrolytic preparation of beryllium-zinc alloys at temperatures below 1,000°C

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, no. 3, 1961, 104 - 107

TEXT: Literature data indicate the possibility of obtaining beryllium-zinc alloys, but there is no information available on the nature of interaction of these elements and on the properties of their alloys. The authors studied the nature of interaction of beryllium and zinc at temperatures up to 1,000°C. Alloys of these elements were obtained by electrolysis of berryllium-containing melts with liquid zinc cathode permitting the accurate regulation of the alloy composition and of the rate of supplying one component to the surface of the other one. Alloys from a molten chloride bath were obtained in a closed electrolytic cell (Figure 1) with a molten zinc cathode. The electrolyte temperature was 700 ± 10°C. Prior to electrolysis the melt was blown through with dry hydrogen chloride. After termination of the experiment the alloy was cooled either together with the electrolyte,

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D. W   of zinc-beryllium
     Card 1/3   sublimated in a vacuum and
                            are 6 figures and 9 references: 4
Card :   [English references: A. R. Kaufman, P. Gordon
              Soc. Metal, 42, 1950; J. G. Beach, C. L. Faust, J.

Electrolytic preparation of beryllium-zinc ...

21119
S/149/61/000/003/002/004
A006/A106

Electrochem. Soc., 100 (6), 276 (1953); G. V. Raynor, J. of the Royal Aeronautical
Soc., 50, 390 (1946)]

ASSOCIATION: Ural'skiy politekhnicheskiy institut (Ural Polytechnic Institute)
Fiziko-tekhnicheskiy fakultet (Physicotechnical Division)

SUBMITTED: January 11, 1961

Figure 1:

Schematic drawing of a closed electrolytic cell.
1 - graphite anode; 2 - rubber seals; 3 - glass
tubes; 4 - cover; 5 - electrolyte; 6 - zinc
cathode; 7 - thermocouple; 8 - molybdenum power
connection to the cathode; 9 - thermocouple hous-
ing; 10 - porcelain bucket; 11 - alundum crucible.
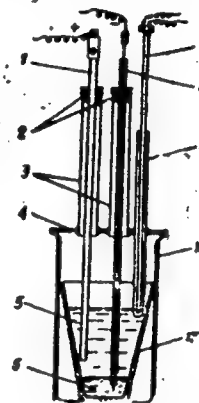
Card 3/3

23080

S/078/61/006/006/006/013
B110/B206

Effect of the nature of alkali-metal ...

cylindrical Be electrode with a diameter of 5-10 mm contained only 0.01% electronegative impurities. A carbon-chlorine electrode served as reference electrode. Under equal working conditions (constant temperature and rate of introduction of chlorine), the potentials of the chlorine electrode and the Be electrode were almost equal in the electrolytes LiCl, KCl and CsCl. The emf measurements with various electrolytes (Fig. 2) correspond to the following empirical equations:

$$2,00 \text{ mol } \% \text{ BeCl}_2 + \text{LiCl at } 649\text{—}905°: E_1 = 2,527\text{—}3,73 \cdot 10^{-4} \cdot T \pm 0,003 \text{ V}$$
$$0,46 \text{ mol } \% \text{ BeCl}_2 + \text{LiCl at } 620\text{—}880°: E_2 = 2,522\text{—}277 \cdot 10^{-4} \cdot T \pm 0,004 \text{ V}$$
$$8,17 \text{ mol } \% \text{ BeCl}_2 + 3\text{LiCl} + 2\text{KCl at } 421\text{—}755°: E_3 = 2,703\text{—}4,97 \cdot 10^{-4} \cdot T \pm 0,008 \text{ V}$$
$$1,2 \text{ mol } \% \text{ BeCl}_2 + 3\text{LiCl} + 2\text{KCl at } 393\text{—}940°: E_4 = 2,658\text{—}3,56 \cdot 10^{-4} \cdot T \pm 0,005 \text{ V}$$
$$9,77 \text{ mol } \% \text{ BeCl}_2 + \text{KCl at } 779\text{—}1007°: E_5 = 2,692\text{—}3,62 \cdot 10^{-4} \cdot T \pm 0,002 \text{ V}$$
$$0,60 \text{ mol } \% \text{ BeCl}_2 + \text{KCl at } 796\text{—}1023°: E_6 = 2,637\text{—}1,86 \cdot 10^{-4} \cdot T \pm 0,003 \text{ V}$$
$$10,1 \text{ mol } \% \text{ BeCl}_2 + \text{CsCl at } 666\text{—}930°: E_7 = 2,807\text{—}4,43 \cdot 10^{-4} \cdot T \pm 0,005 \text{ V}$$
$$0,47 \text{ mol } \% \text{ BeCl}_2 + \text{CsCl at } 695\text{—}950°: E_8 = 2,790\text{—}2,91 \cdot 10^{-4} \cdot T \pm 0,005 \text{ V}$$

and agreed well with the values by L. Jang and R. G. Hudson (Trans Metallurg. Soc. AIME, 215, 589 (1959). If the thermo emf E_T = (-0.0076 + 0.174·10^{-4} T) ± 0.001 V is inserted, the following is obtained:

Card 2/7

23080

S/078/61/006/006/006/013
B110/B206

Effect of the nature of alkali-metal ...

potential: $E = E^0_{Be/Be^{2+}} + (2.3\ RT/2F)\cdot lg\ [Be^{2+}]$. The following equations hold: LiCl melt: $E^0_{Be/Be^{2+}} = -2.538 + 5.7\cdot10^{-4}\cdot T$ v; 3 LiCl + 2 KCl melt:

$E^0_{Be/Be^{2+}} = -2.702 + 6.4\cdot10^{-4}\cdot T$ v; KCl melt: $E^0_{Be/Be^{2+}} = -2.727 + 5.3\cdot10^{-4}$

$\times T$v; CsCl melt: $E^0_{Be/Be^{2+}} = -2.834 + 5.9\cdot10^{-4}\cdot T$ v. The effect of the

metal cations gets evident through the difference of LiCl and CsCl which amounts to 0.276 v at 1000°K. The effective cation radius r_{ef} in the

equimolecular sodium- and potassium chloride is $r_{ef} = (r_{Na^+} + r_{K^+})/2$

= (0.98 + 1.33)/2 = 1.16. The ion potential is then: e/r = 1/1.16

= 0.862 and $E^0_{Be/Be^{2+}} = -2.718 + 5.83\cdot10^{-4}\cdot T$ v. The difference between

the E^0 values in different melts equals the emf: $E = E^0_{Be'/Be^{2+}} - E^{0''}_{Be/Be^{2+}}$

of the galvanic element Be/BeCl$_2$, Me'Cl//BeCl$_2$, Me''Cl/Be. It is a direct

measure for the change of the isobaric potential at a transition of the

Be^{2+} ions from the melt with lower bond energy to the chlorine anion in

Card 4/7

2?080

S/078/6?/006/006/006/013
B110/B206

Effect of the nature of alkali-metal ...

with the ion potential e"/r is $\Delta Z = 19833 \left[(e''/r'') - (e'/r')\right]$ cal/g ion

$BeCl_2$. There are 9 figures and 17 references: 21 Soviet-bloc and 6 non-Soviet-bloc. The references to the English-language publications read as follows: Ref. 5: K. K. Stern, J. Phys. Chem., 60, 579 (1956); Ref. 11: L. Jang, R. G. Hudson, J. Electrochem. Soc., 106, 986 (1959); Ref. 10: H. Laitinen, T. W. Pankey, J. Amer. Chem. Soc., 81, 1053 (1959).

ASSOCIATION. Ural skiy filial Akademii nauk SSSR. Institut elektrokhimii
              (Ural Branch of the Academy of Sciences USSR. Institute of
              Electrochemistry)

SUBMITTED. May 4, 1960

Card 6/7

Redox potential of the system...

conclude that in the potentiometric titration with hydrogen not $E^o_{Ti^{2+}/Ti^{3+}}$ was measured, but only the potential which corresponds to the equilibrium in the system $TiCl_3$ melt $+ 0.5H_{gas} \rightleftarrows TiCl_2$ melt $+ HCl_{gas}$. To obtain the value $E^o_{Ti^{2+}/Ti^{3+}}$, the authors conducted the potentiometric titration with metallic titanium. The initial salt solution was prepared by blowing $TiCl_4$ vapor through an equimolar mixture of NaCl and KCl. The redox potential was measured by a molybdenum electrode referred to a chlorine electrode. For a rapid balancing of the concentration of Ti^{2+} and Ti^{3+} in the melt, the molybdenum electrode rotated at 60 rpm. The potentiometric curves of Fig. 3 were obtained. Their course depends on experimental conditions (temperature, concentration, intermixture). But all of them show the typical salient point which corresponds to the redox potential $E^o_{Ti^{2+}/Ti^{3+}} = 1.726 \pm 0.005$ v (referred to chlorine electrode). On the basis of the earlier established $E^o_{Ti/Ti^{2+}} = (-2.371 + 6.09 \cdot 10^{-4}T)$ v,

Card 2/5

Redox potential of the system...   S/020/61/136/006/020/024
                                                B101/B203

the authors calculate $E^{o}_{Ti/Ti^{3+}} = (-2.156+3.82 \cdot 10^{-4}T)$ v, and find

log K = - 2.888 + 3.251/T for the equilibrium constant. The resulting K values are: 2.82 at 700°C; 1.35 at 800°C; 0.76 at 900°C; and 0.46 at 1000°C. Thus, the equilibrium of reaction (1) is displaced to the left with rising temperature. In contrast to other researchers, the authors could not establish a dependence of the redox potential on the titanium concentration. There are 3 figures, 2 tables, and 7 references: 3 Soviet-bloc and 4 non-Soviet-bloc.

ASSOCIATION: Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR
               (Institute of Electrochemistry of the Ural Branch of the
               Academy of Sciences USSR)

PRESENTED: September 5, 1960, by A. N. Frumkin, Academician

SUBMITTED: August 31, 1960

Card 3/6

LOGINOV, N.A.; SMIRNOV, M.V.

Oxidation-reduction potential of Ti^{3+}/Ti^{4+} and equilibrium constant of the reaction $3Ti^{4+} + Ti \rightleftarrows 4Ti^{3+}$ in an equimolar mixture of sodium and potassium chloride melts. Trudy Inst. elektrokhim. UFAN SSSR no.3:17-24 '62.   (MIRA 16:6)

(Electrodes, Titanium)
(Oxidation-reduction reaction)
(Fused salts)

KOMAROV, V.Ye.; SMIRNOV, M.V.; BARABOSHKIN, A.N.

Anodic solution of zirconium and hafnium in fused salts. Trudy
Inst. elektrokhim. UFAN SSSR no.3:25-39 '62.   (MIRA 16:6)

(Zirconium)   (Hafnium)
(Fused salts—Electric properties)

SKIBA, O.V.; SMIRNOV, M.V.; RYZHIK, O.A.

Polarization of the uranium anode in the electrolysis of a
mixture of potassium and sodium chlorides. Trudy Inst.
elektrokhim. UFAN SSSR no.3:41-48 '62.   (MIRA 16:6)

(Electrodes, Uranium)
(Alkali metal chlorides)
(Polarization(Electricity))

SMIRNOV, M.V.; BAYEVA, T.F.; KOMAROV, V.Ya.

Chronopotentiometric method of measuring the diffusion
coefficients of tetravalent hafnium in chloride and fluoride-
chloride melts. Trudy Inst. elektrokhim. UFAN SSSR no.3:
59-64   '62.   (MIRA 16:6)

(Hafnium compounds)   (Diffusion)
(Fused salts)   (Potentiometric analysis)

ANFINOGENOV, A.I.; SMIRNOV, M.V.; ILYUSHCHENKO, N.G.; BELYAYEVA, G.I.

Study of the thermodynamics of the beryllium - copper system
by the electromotive force method. Trudy Inst. elektrokhim.
UFAN SSSR no.3:83-100 '62.   (MIRA 16:6)

(Beryllium-copper alloys—Thermodynamic properties)
(Electromotive force)

S/200/62/000/004/001/002
D204/D307

AUTHORS: Smirnov, M.V., and Loginov, N.A.

TITLE: Study of the equilibrium between metallic titanium and
              its di- and trivalent ions in molten NaCl-KCl, by the
              method of equilibrium potentials

PERIODICAL: Akademiya nauk SSSR. Sibirskoye otdeleniye. Izvestiya,
              no. 4, 1962, 64 - 72

TEXT: The authors studied the reaction $2Ti^{3+}_{(melt)} + Ti_{(solid)} \rightleftharpoons$

$3Ti^{2+}_{(melt)}$, to demonstrate the usefulness of the method of equilibium
potentials, in an equimolar melt of NaCl-KCl containing 0.23, 0.7,
1.4 and 5.64 % Ti, between 701 and 975°C. The theoretical background
is given. Equilibrium potentials of the Ti electrode were measured
under argon against a comparison chlorine electrode, with an accura-
cy of ± 1 mv, at a series of temperatures maintained within ± 1.5°C.
The temperature dependence is of standard electrode potentials were
found to be $E^{O}_{Ti/Ti}{}^{2+} = - 2.382 + 4.83 \times 10^{-4}T$, $E^{O}_{Ti/Ti}{}^{3+} = - 2.158 +$
Card 1/2

43055

S/826/62/000/000/005/007
D408/D307

5.4700

AUTHORS: Smirnov, M.V., Baraboshkin, A.N., Komarov, V.Ye.
and Saltykova, N.A.

TITLE: Cathodic and anodic processes during the
electrolysis of chloride and fluoride-
chloride containing zirconium and hafnium.

SOURCE: Fizicheskaya khimiya rasplavlennykh soley i
shlakov; trudy Vses. soveshch. po fiz.khimii
raspl. soley i shlakov, 22 - 25 noyabrya 1960
g., Moscow, Metallurgizdat, 1962, 257 - 265

TEXT: A continuation of previous investigations of
electrode processes during the electrolysis of chloride and
fluoride-chloride melts containing other polyvalent transition
metals. Anodic and cathodic polarization curves were obtained
by measuring the electrode potentials at the moment of switching
on the polarizing current. Polarization curves are presented for
e.g. the anodic solution of Zr and Hf in molten equimolar mixtures

Card 1/5

Cathodic and anodic processes ...   S/826/62/000/000/005/007
D408/D307

but partly to change in the diffusion coefficient of the ions in
the high concentration region and, thus, to change in the thickness
of the diffusion layer. The anodic polarization curves shift to the
side of more positive potentials with increase in temperature, but
the general character of the dependence of the anodic potential on
current density does not change substantially. The following expres-
sion was derived for the average valency of the metal ions passing
into solution at potential φ:

$$\varphi = E^{o}_{Me^{4+}/Me^{2+}} + 0.992 \times 10^{-4} \log \frac{n-2}{4-n} \quad , \tag{5}$$

where Me--metal; n--average valency of the metal ions $= 4 - 2x$;
x--proportion of Me^{2+} . At low i the experimentally found average
Hf ion valencies, were lower than those calculated from Eq. (5);
at high current densities the experimental results were higher than
the calculated ones. The cathodic polarization of Zr and Hf has the
same character as that of Th and Ti but, in contrast to the latter

Card 3/5

S/826/62/000/000/005/007
Cathodic and anodic processes ...D408/D307

ASSOCIATION: Institut elektrokhimii UFAN (Institute of
Electrochemistry UFAS)

Card 5/5

43056
S/826/62/000/000/007/007
D408/D307

5.4760

AUTHORS: Smirnov, M.V., Komarov, V.Ye., and
Baraboshkin, A.N

TITLE: The equilibrium potentials of hafnium and
             zirconium in chloride and fluoride-chloride
             melts

SOURCE: Fizicheskaya khimiya rasplavlennykh soley i
             shlakov; trudy Vses. soveshch. po fiz. khimii
             raspl. soley i shlakov, 22 - 25 noya brya 1960
             g. Moscow, Metallurgizdat, 1962, 353 - 360

TEXT: The above potentials were measured in equimolar
NaCl--KCl melts containing a) 0.16 - 6.8 wt.% Zr, or 0.16 -1.51
wt.% Hf and b) 2 - 35 wt.% NaF and 0.17 - 1.05 wt.% Zr, or
0.99 - 3.4 wt.% Hf, between 700 and 950°C, to explain processes
occurring during the electrolysis of chloride melts containing
Zr and Hf, to calculate the thermodynamic quantities ΔZ, ΔH,
and ΔS for the formation of $MeCl_2$ and $MeCl_4$ (Me--Zr of Hf)
from their elements in melts of specific composition, and to
Card 1/3

The equilibrium potentials ...   S/826/62/000/000/007/007
D408/D307

n is the average valency of the Zr ions. At 770°C in electrolytes containing 2.04 - 15.82 wt.% F and 1.05 $\pm$ 0.2 wt.% Zr, the average Zr valency was $4 \geqslant n \geqslant 3.23$, when m decreased from 6 to 5. The equilibrium potential of Hf was found to be more negative than that of Zr in melts containing the same concentrations of Me and F ions, the difference in potential decreasing with increasing temperature. HfF_6^{2-} was shown to be slightly more stable than ZrF_6^{2-} . There are 3 figures.

ASSOCIATION: Institut elektrokhimii UFAN (Institute of Electro-
                chemistry UFAS)

Card 3/3

SKIBA, O.V.; SMIRNOV, M.V.; KHAZEMOVA, T.F.

Diffusion coefficients of U^3, U^4, and UO_2 ions in fused NaCl – KCl. Trudy Inst.elektrokhim. UFAN SSSR no. 4:11-15 '63.   (MIRA 17:6)

LOGINOV, N.A.; SMIRNOV, M.V.

Current efficiency in the anodic dissolution of titanium in chloride and mixed fluroide-chloride melts. Trudy Inst. elektrokhim. UFAN SSSR no. 4:29-33 '63.   (MIRA 17:6)

ANFINOGENOV, A.I.; SMIRNOV, M.V.; ILYUSHCHENKO, N.G.

Electrolytic deposition of beryllium on copper in fused salts.
Trudy Inst.elektrokhim. UFAN SSSR no. 4:47-53 '63. (MIRA 17:6)

S/2631/63/000/004/0055/0066

ACCESSION NR: AT4008733

AUTHOR: Anfinogenov, A. I.; Belyayeva, G. I.; Smirnov, M. V.; Ilyushchenko, N. G.

TITLE: Structure and phase composition of beryllium coatings deposited on copper in fused salt electrolytes

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 4, 1963. Elektrokhimiya rasplavlenny*kh solevy*kh i tverdy*kh elektrolitov, 55-66

TOPIC TAGS: beryllium coating, beryllium plating, beryllium plated copper, coating structure, coating phase composition, fused salt electrolysis, fused salt, beryllium electrodeposition

ABSTRACT: Rates of Be deposition (i.e. cathode current density) and mutual diffusion of Be and Cu (i.e. temperature and duration of electrolysis) were studied in relation to their effects on the structure and phase composition of coatings deposited on a cathode during electrolysis in fused salts. Be was deposited on Cu cathodes in a fused electrolyte (eutectic mixture of KCl + NaCl + 16% $BeCl_2$ by weight at temperatures of 710, 750, 800 and 835C, current densities of 0.004, 0.01, 0.02 and 0.04 a/cm^2 and exposures of 1, 2, 4, 6 and 8 hours. The electrolytic cell was described in AN SSSR, Ural'skiy filial. Institut elektrokhimii. Trudy*, no. 4, 1963, 47-53. The results tabulated in the original and shown

Card   1/2

ACCESSION NR: AT4008733

In Figs. 1, 2, 3 and 4 in the Enclosure indicate that cathode deposition of Be on Cu is accompanied by the formation of deposits consisting of one or more phases. Structure of the deposits is determined by current density, temperature and duration of the electrolytic process. It was also demonstrated that such conditions of the process promote the most rapid formation and accumulation of the β-phase. Microstructure of the BeCu coating is shown on several microphotographs for the α, β and γ phases. G. V. Burov, staff member of the Institute, performed the structural x-ray analysis. G. V. Chentsovaya and L. P. Tomilovaya, other members of the Institute, performed the spectral analysis. Orig. art. has: 2 tables, 4 graphs, 7 illustrations.

ASSOCIATION: Institut Elektrokhimii, Ural'skiy filial AN SSSR (Institute of Electrochemistry, Ural branch AN SSSR)

SUBMITTED: 00   DATE ACQ: 25Jan64   ENCL: 06

SUB CODE: ML, MA   NO REF SOV: 011   OTHER: 002

Card   2/82

SMIRNOV, M.V. (Sverdlovsk); BARABOSHKIN, A.N. (Sverdlovsk); KOMAROV, V.Ye. (Sverdlovsk)

Cathodic processes in the deposition of zirconium from chloride melts. Zhur.fiz.khim. 37 no.8:1669-1676 Ag '63.   (MIRA 16:9)

1. Institut elektrokhimii Ural'skogo filiala AN SSSR.
        (Zirconium plating) (Fused salts)

SMIRNOV, M.V. (Sverdlovsk); BARABOSHKIN, A.N. (Sverdlovsk); KOMAROV, V.Ye.
(Sverdlovsk)

Cathodic processes in the deposition of zirconium from mixed chloride-
fluoride melts. Zhur.fiz.khim. 37 no.8:1677-1681 Ag '63.
(MIRA 16:9)

(Zirconium plating) (Fused salts)

L 14354-63   EWP(q)/EWT(m)/BDS   AFFTC   JD/JW/JG

ACCESSION NR: AP3003854   S/0020/63/151/003/0591/0594

55

AUTHORS: Smirnov, M. V.; Usov, P. M.; Khazemova, T. F.

TITLE: Reaction of metallic lanthanum with a melt of its trichloride and the equilibrium constant of the reaction

SOURCE: AN SSSR. Doklady*, v. 151, no. 3, 1963, 591-594

TOPIC TAGS: lanthanum, melt diagram, entropy, equilibrium constant

ABSTRACT: The reaction between molten La and $LaCl_3$ was measured electrochemically. Reaction between La and $LaCl_3$ was independent of temperature, a product approximating $LaCl_{2.14}$ was obtained at 864-1063F. Oxidation-reduction potentials showed a linear increase of e.m.f. with temperature (equations are given). E.m.f. data of the systems at equilibrium, shows a mixture of $LaCl_3$ and $LaCl_2$, the latter predominating. The equilibrium-constant, heat capacity and entropy were calculated. The melt diagram for the La-$LaCl_3$ system was drawn, from pure $LaCl_3$ to equilibrium mixtures of $LaCl_2$-$LaCl_3$ and metallic La. Below 827F there was no $LaCl_2$ in the solid phase, only La finely dispersed in $LaCl_3$. Above this temperature, in the 0-9 mol.% La range, the excess $LaCl_3$ crystallized. Orig. art. has: 3 figures, 1 table, 10 equations

Card 1/2

L 17549-63

ACCESSION NR: AP3004426

elements, DELTA F = -160,000 + 38.3 T cal, DELTA H = -160.0 kcal, and DELTA S = -37.3 cal/°. Orig. art. has: 3 figures and 1 table and 13 formulas.

ASSOCIATION: none

SUBMITTED: 18Feb63   DATE ACQ: 21Aug63   ENCL: 00

SUB CODE: CH, PH   NO REF SOV: 003
                                                           OTHER: 002

Card 2/2

AM4037183   BOOK EXPLOITATION   S/

Kozlov, Svyatoslav Nikolayevich; Smirnov, Mikhail Vasil'yevich; Baz',
  Ivan Stepanovich; Sidorov, Petr Aleksandrovich

Soviet military science (O sovetskoy voyennoy nauke), 2d rev. and enl.
  ed. Moscow, Voyenizdat M-vo obor. SSSR,1964. 403 p. biblio.
  15,000 copies printed.

TOPIC TAGS: Soviet military science, Soviet military theory, nuclear
  weapons, modern warfare

PURPOSE AND COVERAGE: The book is intended for officers of the Soviet
  Army and Navy, and for civilian readers interested in military service.
  The development of military theory and the principles of modern war-
  fare are presented and the decisive importance of rockets and nuclear
  weapons is explained. The effect of the decisions of the 22nd Party
  Congress and the Party Program on the Soviet theory of war is also
  discussed. No personalities are mentioned. There are no references.

TABLE OF CONTENTS:

Card 1/2

SMIRNOV, M.V.; SKIBA, O.V.

Thermodynamics of interaction of uranium tri- and tetrachloride
in NaCl - KCl melts with oxygen. Trudy Inst. elektrokhim. UFAN
SSSR no.5:3-6 '64.   (MIRA 18:2)

SMIRNOV, M.V.; STROLOVSKIY, Yu.S.; KRASNOV, Yu.N.

Equilibrium between cerium a d its bi- and trivalent ions in a
fused eutectic mixture of lithium and potassium chlorides. Trudy
Inst. elektrokhim. UFAN SSSR no.5:7-16 '64.

(MIRA 18:2)

SOKOLOVSKIY, Yu.S.; SMIRNOV, M.V.

Polarization during the anodic dissolution of metallic cerium in a fused eutectic mixture of lithium and potassium chlorides. Trudy Inst. elektrokhim. UFAN SSSR no.5:17-31 '64.

Interaction of trivalent cerium ions with fluorine anions in a medium of a fused LiCl - KCl eutectic. Ibid.:33-40

Electrode processes in the electrolysis of cerium in chloride-fluoride melts. Ibid.:47-51

(MIRA 18:2)

SOKOLOVSKIY, Yu.S.; SMIRNOV, M.V.; SKIBA, O.V.

Coefficients of diffusion of trivalent cerium in fused salt
mixtures LiCl - KCl and LiCl - KCl + LiF. Trudy Inst. elektro-
khim. UFAN SSSR no.5.41-45 '64.

(MIRA 18:2)

SMIRNOV, M.V.; KRASNOV, Yu.N.; KHAZEMOV, F.F.

Reaction of lanthanum tichloride with a molten eutectic mixture of lithium and potassium chlorides. Trudy Inst. elektrokhim. RFAN SSSR no.5:53-60 '64.

(MIRA 18:2)

SMIRNOV, M.V.; USOV, P.M.; KHAZEMOVA, T.F.

Melting diagram of the La - LaCl system. Trudy Inst. elektrokhim.
UFAN SSSR no.5:119-122 '64.   (MIRA 18:2)

SMIRNOV, M.V.; KHAYMENOV, A.P.

Theoretical computation of the emf of galvanic cells with molten salt electrolytes exemplified by Be solid $BeCl_2$ + fused $"Cl$ Cl_2(gas), C(graphite). Dokl. AN SSSR 158 no.5:1172-1175 O '64.

(MIRA 17:10)

1. Institut elektrokhimii Ural'skogo filiala AN SSSR. Predstavleno akademikom A.N. Frumkinym.

L 9935-66   EWT(1)/EWT(m)/ETC/EPF(n)-2/EWG(m)/T/EWP(t)/EWP(b)/ETC(m)   IJP(c)

ACC NR: AT5028237 · DS/JD/WH/JW SOURCE CODE: UR/2631/65/000/006/0011/0017
JG

AUTHOR: Smirnov, M. V.; Ryzhik, O. A.

ORG: Institute of Electrochemistry, Ural Branch, Academy of Sciences SSSR (Akademiya nauk SSSR, Ural'skiy Filial, Institut Elektrokhimii)

TITLE: Equilibrium between molybdenum and its ions in molten lithium chloride

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy, no. 6, 1965. Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov (Electrochemistry of fused salts and solid electrolytes), 11-17

TOPIC TAGS: molybdenum, lithium chloride, electrode potential

ABSTRACT: In order to determine the dependence of electrode potentials of molybdenum in a chloride melt on the nature of the alkali metal cations, the authors used the emf method to study the equilibrium between molybdenum and molten lithium chloride containing from 0.27 to 2.49 wt.% Mo in the range of 620 — 950C. Expressions were obtained for the temperature dependence of

$$E_{Mo/Mo^{2+}}, \quad E_{Mo/Mo^{3+}}, \quad E^0_{Mo^{2+}/Mo^{3+}}$$

Card 1/2

KUDYAKOV, V.Ya.; SMIRNOV, M.V.

Potentials of Zr/Zr^{2+}, Zr/Zr^{4+} and Zr^2+/Zr^4 and equilibrium constant of the reaction $Zr + Zr^{4+} \rightleftharpoons 2Zr^{2+}$ in fused KCl. Trudy Inst. elektrokhim. UFAN SSSR no.6:19-27 '65.

(MIRA 18:11)

L 10881-66   EWT(m)/ETC/EWG(m)/EWP(j)/T/EWP(t)/EWP(b)   IJP(c)   DS/JD/JW/JG/RM

ACC NR: AT5028238   SOURCE CODE: UR/2631/65/000/006/0029/0037

AUTHOR: Smirnov, M. V.; Krasnov, Yu. N.; Khazemov, F. F.; Komarov, V. Ye.

ORG: Institute of Electrochemistry, Ural Branch, Academy of Sciences SSSR (Akademiya nauk SSSR, Ural'skiy filial, Institut elektrokhimii)

TITLE: Instability constants of fluoride complexes of lanthanum in the molten eutectic mixture LiCl-KCl

SOURCE: An SSSR, Ural'skiy filial. Institut elektrokhimii. Trudy, no. 6, 1965. Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov (Electrochemistry of fused salts and solid electrolytes), 29-37

TOPIC TAGS: lanthanum compound, complex molecule, lithium fluoride, emf

ABSTRACT: The emf's of the galvanic cells

$$\text{La} \mid KCl - LiCl + LaCl_3 + x\,LiF \parallel KCl - LiCl \mid Cl_2, C$$
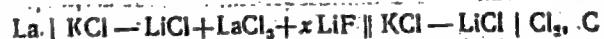
were measured at 600—800C, LiF being present in the electrolyte in amounts of 2.5, 5.0, 10, and 20 wt. %. The experimental data showed the existence of the following lanthanum complexes in the melt: LaF^{2+}, LaF_2^+, and LaF_3. Expression for the temperature dependence of the instability constants of these complexes were obtained:

Card 1/3

L 10881-66

ACC NR: AT5028238

relative to a chlorine reference electrode.   Fused salts

SUB CODE: 07/ SUBM DATE: none/ ORIG REF: 005   18

jw

Card 3/3

L 62938-65   EPF(c)/EPF(n)-2/EPA(s)-2/EWT(1)/EWT(m)/EWP(b)/EWP(t)   IJP(c)   WW/JD/JG
ACCESSION NR: AR5019133   UR/0137/65/000/007/A010/A010

SOURCE: Ref. zh. Metallurgiya, Abs. 7A61

AUTHOR: Smirnov, M. V.; Usov, P. M.; Lbov, V. S.; Shabanov, O. M.

TITLE: Electrical conductivity and transfer numbers in the melt system $LaCl_3$ + La

CITED SOURCE: Tr. In-ta elektrokhimii. Ural'skiy fil. AN SSSR, vyp. 6, 1965, 57-64

TOPIC TAGS: liquid metal, lanthanum, lanthanum chloride, inorganic anion, electric conductivity

TRANSLATION: The specific electrical conductivity of a melt of $LaCl_3$ + La, from pure $LaCl_3$ to $LaCl_{2.14}$ was measured in the interval 900-1015C. The specific ionic conductivity increases from approximately 1.5 $ohm^{-1} \cdot cm^{-1}$ for $LaCl_3$ to approximately 2.5 $ohm^{-1} \cdot cm^{-1}$ for $LaCl_{2.14}$. Determinations were made of the transfer numbers of cationic and anionic chlorine in melts of $LaCl_3$ and $LaCl_2$, with respect to a solid porous diaphragm, at 900C. In a melt of $LaCl_3$, the current through the diaphragm is basically carried by chlorine anions ($n_a = 0.9$),

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L 62941-65   EPF(c)/EPF(n)-2/EPA(s)-2/EWT(m)/EWP(b)/EWP(t)   IJP(c)   WW/JD/JG

ACCESSION NR: AR5019134   UR/0137/65/000/007/A013/A013

SOURCE: Ref. zh. Metallurgiya, Abs. 7A78

AUTHOR: Usov, P. M.; Smirnov, M. V.

TITLE: Cathode polarization in electrolysis of a lanthanum trichloride melt

CITED SOURCE: Tr. In-ta elektrokhimii. Ural'skiy fil. AN SSSR. vyp. 6,
1965, 65-68

TOPIC TAGS: liquid metal, lanthanum, lanthanum chloride, cathode polarization,
electrolytic deposition, molybdenum

TRANSLATION: A study was made of the polarization of a molybdenum cathode
during the electrolysis of a $LaCl_3$ melt at 860 and 960C. The vertical sections
(on the polarization curves), observed at $D > 1$ a/cm^2, correspond to the separat-
ing out of metallic lanthanum. Its equilibrium potential in a melt of $LaCl_{2.14}$
is equal to 2.524 volts at 860C and to 2.439 volts at 960C. The diffusion coeffi-
cients for La^{3+} and La^{2+} in a melt of $LaCl_3$ are equal respectively to $(0.9-1.1) \cdot
10^{-6}$ and $(2.9-3.2) \cdot 10^{-4}$ cm^2/sec. Metallic lanthanum starts to separate out on

Card 1/2

L 9940-66
ACC NR: AT5028242   SOURCE CODE: UR/2631/65/000/006/0069/0073

AUTHOR: Smirnov, M. V.; Tsiovkina, L. A.; Oleynikova, V. A.

ORG: Institute of Electrochemistry, Ural Branch, Academy of Sciences SSSR
(Adademiya nauk SSSR, Ural'skiy filial, Institut elektrokhimii)

TITLE: Processes occurring at a platinum and nickel cathode during electrolysis
of carbonate melts

SOURCE: AN SSSR. Ural'skiy filial. Institut elektrokhimii. Trudy. no. 6, 1965.
Elektrokhimiya rasplavlennykh solevykh i tverdykh elektrolitov (Electrochemistry of
fused salts and solid electrolytes), 69-73

TOPIC TAGS: carbonate, electrolysis, cathode polarization, platinum, nickel,
carbon, carbon monoxide

ABSTRACT: The cathodic polarization of platinum (at 640C) and nickel (at 600 and
700C) was studied during the electrolysis of the ternary mixture Li_2CO_3-Na_2CO_3-
K_2CO_3 (4:3:3) in the range of current densities of 10^{-4} to 1-2 A/cm^2. The pro-
ducts formed at the cathode were investigated. It is shown that depending upon the
current density, various electrode reactions take place: at current densities below

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L 9940-66
ACC NR: AT5028242

10^{-3} A/cm^2, the cathode surface remains lustrous without any trace of deposition
of any products; at 10^{-3} - 10^{-2} A/cm^2, a spongy deposit of finely divided carbon is
formed; above 10^{-2} A/cm^2, carbon monoxide is evolved, and its volume increases
with the current. Polarization has a concentration character and is associated with
the migration of carbonate ions from the volume of the electrolyte to its surface.
Orig. art. has: 3 figures and 2 formulas.

SUB CODE: 07 / SUBM DATE: None / OTH REF: 003

Card 2/2

L 48969-65   EPA(s)-2/EWT(m)/EPF(c)/EWA(d)/EWP(t)/EWP(z)/EWP(b)/EPF(n)-2
IJP(c)   JD/WW/JG
ACCESSION NR: AP5007749   S/0364/65/001/001/0059/0062

AUTHOR: Smirnov, M. V.; Ryzhik, O. A.; Kazantsev, G. N.

TITLE: Diffusion of trivalent molybdenum in a medium of fused chlorides of alkali
metals

SOURCE: Elektrokhimiya, v. 1, no. 1, 1965, 59-62

TOPIC TAGS: molybdenum, chloride, alkali metal, diffusion coefficient

ABSTRACT: The diffusion of molybdenum in dilute solutions of its trichloride in
fused chlorides of alkali metals was studied. The concentration of molybdenum in
these melts did not exceed $5 \cdot 10^{-4}$ g-equiv/cm^3. Therefore the interaction of its
ions was significant only with a salt solvent. The chronopotentiometric method
with polarization of the electrode by a current with a constant density higher than
the maximum diffusion density was used to measure the diffusion coefficient of the
dilute component of the melt. The tests were conducted in hermetically sealed cells
in which the gas chamber was filled with thoroughly purified helium (see fig. 1 of
the Enclosure). The solvent electrolytes were previously recrystallized chlorides

Card 1/3

L 48969-65
ACCESSION NR: AP5007749

of lithium, potassium, and cesium and also eutectic LiCl-KCl. The diffusion co-
efficient of trivalent molybdenum was calculated according to the equation

$$D = 1.37 \cdot 10^{-6} \left(\frac{MI}{3a\rho S} \right)^2 \tau \text{ cm}^2/\text{sec}$$

where a is the concentration of molybdenum in weight %; M is the molecular weight;
I is the strength of current in amperes; S is the area of the cathode in cm^2; ρ is
the density of the electrolyte in g/cm^3. As the cation radius of the alkali metal
increases, the rate of diffusion of the trivalent molybdenum decreases. The values
of the activation energy are linearly related to the inverse magnitudes of the
cation radii of the salt solvents. It is suggested that the diffusion process
occurs through "jumping" of the molybdenum cations from one point of the quasi-
lattice of the fusion to another. Orig. art. has: 3 figures.

ASSOCIATION: Ural'skiy politekhnicheskiy institut imeni S. M. Kirova (Ural Poly-
technical Institute)

SUBMITTED: 15Sep64   ENCL: 01   SUB CODE: MM, GC

NO REF SOV: 013   OTHER: 003

Card 2/3

L 48969-65
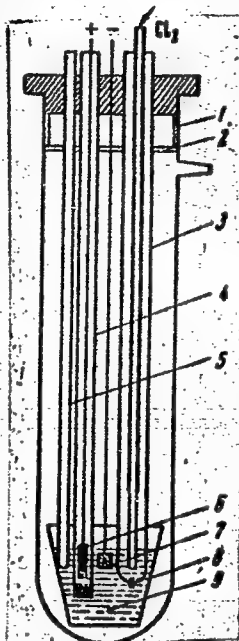ACCESSION NR: AP5007749

ENCLOSURE: 01

Fig. 1. Cell for measurements: 1--quartz
glass test tube; 2--fluoroplastic screen;
3--quartz capsule with chlorine comparison
electrode; 4--quartz jacket with diaphragm;
5--chromel-alumel thermocouple; 6--carbon
anode on a molybdenum current feeder;
7--platinum cathode; 8--alundum crucible;
9--test electrolyte

Card 3/3

L 49454-65   EPF(c)/EPP(n)-2/EPA(s)-2/EWT(m)/EWP(b)/EWP(t)   Pr-4/Pt-7/Pu-4   IJP(c)

WW/JD/JG

ACCESSION NR: AP5009941   UR/0364/65/001/002/0143/0148

AUTHOR: Kudyakov, V. Ya.; Smirnov, M. V.

TITLE: Equilibrium potentials of zirconium in fused cesium chloride

SOURCE: Elektrokhimiya, v. 1, no. 2, 1965, 143-148

TOPIC TAGS: zirconium, cesium chloride, electrochemistry, galvanic cell

ABSTRACT: This is a continuation of the study of equilibrium potentials of zir-
conium in fused alkali metal halides. The equilibrium potentials of zirconium in
a CsCl melt were measured in the 650-900°C range. The cell for measurement of the
emf of zirconium was a wide hermetically sealed quartz test tube, shown in fig. 1 of
the Enclosure. Doubly recrystallized CsCl was used. From the experimental data
standard electrode potentials of Zr/Zr^{+2}, Zr/Zr^{+4} couples were calculated and also
the oxidation-reduction potential of the Zr^{+2}/Zr^{+4} system. By measuring the cur-
rent efficiency of anodic dissolution of metallic zirconium it was shown that the
primary ions which are in equilibrium with the metal in CsCl melt are Zr^{+2} and
Zr^{+4} rather than Zr^{+3}. For Zr^{+2}/Zr^{+4} couples the oxidation-reduction potential in

Card 1/12

L 3781—66   EWT(m)/EWP(t)/EWP(b)   IJP(c)   JD/JG

ACCESSION NR: AP5014138   UR/0365/65/001/003/0335/0337
                                               669.28 : 620.193.43

AUTHOR: Smirnov, M. V.; Ryzhik, O. A.; Savochkin, Yu. P.

TITLE: Electrochemical corrosion of molybdenum in a chloride melt

SOURCE: Zashchita metallov, v. 1, no. 3, 1965, 335-337

TOPIC TAGS: molybdenum, corrosion, potassium chloride

ABSTRACT: The stationary potentials of molybdenum are measured with respect to a chlorine comparison electrode in thoroughly purified molten potassium chloride. The experiments were done at 790-920° in a helium-filled hermetically sealed capsule. The empirical equation for the temperature relationship of the stationary potential of molybdenum in a KCl solution with regard to the thermoelectromotive force between the molybdenum and carbon electrodes is

$$E_{st} = -2.082 + 2.47 \cdot 10^{-4} \cdot T \pm 0.004 \text{ v.}$$

Calculations show that corrosion rates in the 800-950° temperature range are of the order of 10^{-7} a/cm^2 in pure KCl. However, when easily reduced impurities are

Card 1/2

SMIRNOV, M.V.; MAKSIMOV, V.S.

Solubility and decomposition potential of titanium tetrachloride in fused
potassium chloride. Elektrokhimiia 1 no.6:727-730 Je '65.   (MIRA 18:7)

1. Institut elektrokhimii Ural'skogo filiala AN SSSR.

L 7969-66   EWT(m)/ETC/EWG(m)/T/EWP(t)/EWP(b)   IJP(c)   DS/JD/JG
ACC NR: AP5025080   SOURCE CODE: UR/0364/65/001/010/1218/1224

AUTHOR: Tsiovkina, L. A.; Smirnov, M. V.; Oleynikova, V. A.

ORG: Institute of Electrochemistry of the Ural Branch of the Academy of Sciences
SSSR (Institut elektrokhimii Ural'skogo filiala Akademii nauk SSSR)

TITLE: Anode processes on platinum in the electrolysis of carbonate melts

SOURCE: Elektrokhimiya, v. 1, no. 10, 1965, 1218-1224

TOPIC TAGS: electrolytic cell, electrode, platinum, gas adsorption, oxygen,
carbonate, lithium, potassium, sodium

ABSTRACT: The article is an attempt to fully explain the effect of adsorbed oxy-
gen on the polarization of a platinum electrode. The experiments were carried
out in hermetically sealed cells which made it possible to eliminate the dissolved
oxygen from the carbonate melts. A melted mixture of the carbonates Li_2CO_3,
K_2CO_3, and Na_2CO_3 in the ratio 3:4:3 was placed in a platinum crucible. The
electrode investigated was a platinum sheet about 1 cm^2 in area. Its potential was

Card 1/2

UDC:541.135.3

SMIRNOV, M.V.; RYZHIK, O.A.

Inertness of metal electrodes in fused salt electrolytes. Izv.
vys. ucheb. zav.; tsvet. met. 8 no.1:86-89 '65.

(MIRA 18:6)

1. Ural'skiy politekhnicheskiy institut.

MELTON, M.V.; RUDYAK, V.M.

Thermodynamics of the reaction of zirconium di- and tetrachloride
with alkali metal chlorides in melts. Zhur. neorg. khim. 10
no.5:1211-1212 My '65.   (MIRA 18:6)

ABSTRACT: In order to elucidate the stability of the potential of the platinum
oxygen reference electrode in molten carbonates under various conditions, the emf
of the galvanic cell

$$-Pt, \; CO_2 + O_2 \mid Na_2CO_3 + K_2CO_3 \mid NaCl + KCl \mid (Cl_2), \; C+$$
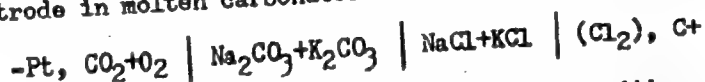
was studied at 770-1000°C as a function of temperature and composition of the gas
mixture bathing the platinum. One of the half-cells was platinum bathed with a
$CO_2 + O_2$ mixture in a molten eutectic mixture of potassium and sodium carbonates, and

Card 1/2

L 42157-66   EWT(m)/T/EWP(t)/ETI   IJP(c)   DS/WW/JD/JG/GD

ACC NR: AT6022482   (A)   SOURCE CODE: UR/0000/65/000/000/0254/0257

AUTHOR: Smirnov, M. V.; Usov, P. M.; Krasnov, Yu. N.; Khazemova, T. F.

ORG: Institute of Electrochemistry, UFAN SSSR (Institut elektrokhimii UFAN SSSR)

TITLE: Reaction of metallic lanthanum with its trichloride

SOURCE: Vsesoyuznoye soveshchaniye po fizicheskoy khimii rasplavlennykh soley. 2d, Kiev, 1963. Fizicheskaya khimiya rasplavlennykh soley (Physical chemistry of fused salts); trudy soveshchaniya. Moscow, Izd-vo Metallurgiya, 1965, 254-257.

TOPIC TAGS: lanthanum, chloride, electrolysis, TRICHLORIDE, CHEMICAL REACTION, EMF

ABSTRACT: The emf method was used to study the reaction of La with $LaCl_3$ and solutions of $LaCl_3$ in the fused eutectic mixture LiCl-KCl in order to determine whether compounds of lanthanum of lower oxidation states exist, and if so, what part they play in the electrolysis of La in fused salt media. The phase diagram of the $LaCl_3$-La system was determined experimentally in the range from the pure trichloride to the product of its saturation with metallic La. The emf of galvanic concentration cells composed of two cells (liquid La in molten $LaCl_3$ saturated with La, and Mo immersed in molten $LaCl_3$ containing 0.35-23/4 mole % dissolved La) at 850-1000 °C showed that the dissolution of La in the trichloride involves its reduction to the di- or monochloride. Emf isotherms plotted from experimental points were similar to those which should be expected for electrolytes made up of a mixture of $LaCl_3$ and $LaCl_2$. It is concluded that metallic La

Card 1/2

L 00133-67   EWT(m)/EWP(t)/EPI   IJP(c)   JD/JG
ACC NR: AP7002758   SOURCE CODE: UR/0364/66/002/008/0953/0957

3/.

SMIRNOV, M. V. and SHABANOV, O. M., Institute of Electrochemistry of the Ural'sk Branch, Academy of Sciences SSSR, Sverdlovsk (Institut elektrokhimii Ural'skogo filiala AN SSSR)
"Diffusion of Ions of Uranium and Molybdenum in Molten Chlorides of Alkali Metals"

ABSTRACT: According to the Stokes-Einstein equation, the diffusion coefficient for ions of tetravalent uranium must be greater than for trivalent, and the rate of diffusion of ions of trivalent molybdenum in a medium of molten chlorides of alkali metals must rise in the order: LiCl - KCl - CsCl with decrease in viscosity. Measurements have show the reverse order to apply. This gives evidence to the fact that the Strokes-Einstein equation does not account for all factors that can affect diffusion rate.

An examination was made of the mechanism of diffusion of multicharged cations in molten chlorides of alkali metals, where they form complex anionic groupings. Displacement of the cation exchange resins occurs chiefly in the composition of complexes, the size and charge of which determine the relaxation retardation on the part of the atmosphere of cations of the salt-solvent. The diffusion coefficents of the above indicated ions calculated on the basis of this mechanism quite satisfactorily agree with experimental data.

It is shown why the ion of trivalent uranium diffuses more rapidly than.

Card 1/2

0925 1632

SOURCE CODE: UR/0365/66/002/006/0700/0704

ACC NR: AP6036115

AUTHOR: Ozeryanaya, I. N.; Manukhina, T. I.; Belyayeva, G. I.; Burakova, E. A.; Smirnov, M. V.

ORG: Acadomy of Sciences SSSR, Ural Branch, Institute for Electrochemistry (Akademiya nauk SSSR, Ural'skiy filial, Institut elektrokhimii)

TITLE: Behavior of chromium nickel alloys in carbonate melts

TOPIC TAGS: chromium containing alloy, nickel containing alloy, corrosion rate, lithium compound, sodium compound

ABSTRACT: The experiments were carried out in a low melting binary eutectic mixture of lithium and sodium carbonates (melting point 497°). To suppress thermal decomposition and possible hydrolysis of the carbonates, the salts were melted in an atmosphere of carbon dioxide gas. The alloys investigated, EI-559A and EI-437B, are solid solutions in nickel of the following elements: EI-559A--18% Cr; 23% Fe; 3.5% Al; other elements about 1%; EI-437B--22% Cr; 4% Fe; 2.5% Ti; about 1% Al. Samples of the alloys, in the form of plates with a polished surface area of 8 cm², were placed in an alundum crucible with the melt. After the experiment, the samples were washed of traces of salts in distilled water, and dried to constant weight. The weight increase

UDC: 620.193.43

Card 1/2

ACC NR: AP7002165   (A, N)   SOURCE CODE: UR/0089/66/021/006/0476/0478

AUTHOR: Smirnov, M. V.; Koryushin, A. P.; Komarov, V. Ye.

ORG: none

TITLE: Interaction of tetravalent uranium with chloride-fluoride NaCl-KCl-NaF melt

TOPIC TAGS: uranium metal, fluoride, chloride, electrolysis, oxidation reduction reaction

ABSTRACT: The purpose of the study was to obtain information on the thermodynamics of interaction between tetravalent uranium and molten fluoride-chloride mixtures, the electrolysis of which is frequently used to produce metallic uranium and crystalline uranium dioxide. This is a continuation of earlier work (Tr. In-ta elektrokhimii Ural. fil. AN SSSR, No. 8, Sverdlovsk, 1966, p. 47) where the equilibrium between metallic uranium and a NaCl-KCl-NaF melt containing uranium ions was studied. Using these data, and measuring the oxidation-reduction potential U(III)/U(IV), the authors studied the interaction between the tetravalent uranium and the chloride-fluoride melt. The measurements were made in a molten equimolar mixture of sodium and potassium chloride containing 3% uranium and 8.0 - 18.5% NaF by weight, in the temperature interval 973-1123K. Experimentally the work consisted of measuring the emf of a cell containing molybdenum as an indicator electrode and the molten mixture. The measurement procedure is briefly described. The results show that the U^{++++}

Card 1/2   UDC: 541.138: 661.879

produces in the investigated melt a fluoride complex UF_8^{--}. An expression is obtained for the temperature dependence of the instability constant of this complex in the melt. Orig. art. has: 8 formulas and 2 tables.

Card   2/2

SMIRNOV, M   V

N/5
743.221
.S6

SMIRNOV, M   V

Avtomobil' samosval MAZ-205; Rukovodstvo po ukhodu (Automobile dump truck MAZ-205) maintenance manual) Moskva, Mashgiz, 1952.
110 p. illus., diagrs., tables.
At head of title: russia. Glavnoye Upravleniye Avtomobil'nykh Zavodov.

SMIRNOV, Mikhail Vasil'yevich; BAZ', I.S.: ZUBKOV, I.I., nauchnyy red.

[On Soviet military science] O sovetskoi voennoi nauke. Moskva,
Voen.izd-vo, 1960. 333 p.   (MIRA 13:11)
          (Military art and science)

SMIRNOV, M.V.

Designing, manufacturing, and operating hydraulic transmissions for ships. [Izd.] LONITOMASH 52:101-107 '59.   (MIRA 12:12)

(Oil hydraulic machinery) (Marine engineering)